WHAT IS CLAIMED IS:

1. A method for monitoring polishing a substrate, the method comprising:

rotating a polishing pad mounted on a platen at a first rotation rate;

rotating a carrier head at a second rotation rate that is different from the first rotation rate, the carrier head carrying a substrate and pressing the substrate against the polishing pad; and

acquiring a sequence of data traces using a sensor mounted in the platen, wherein each data trace results from a separate scan with the sensor along a path across the substrate, and wherein the first and second rotation rates are such that a plurality of paths corresponding to a predetermined number of consecutive scans are substantially evenly radially distributed across the substrate.

2. The method of claim 1, wherein the predetermined number of consecutive scans is less than 10.

3. The method of claim 2, wherein the predetermined number of consecutive scans is 3, 4, 5, or 6.

4. The method of claim 1, wherein a difference between the first and second rotation rates is between about four and about fifteen percent of the first rotation rate.

5. The method of claim 4, wherein a difference between the first and second rotation rates is between about five and about ten percent of the first rotation rate.

6. The method of claim 1, wherein a difference between the first and second rotation rates is between about forty and about sixty percent of the first rotation rate divided by the predetermined number.

7. The method of claim 1, wherein the ratio of the first and second rotation rates is about a ratio of a first prime number and a second prime number.

8. The method of claim 7, wherein there is a third prime number between the first and second prime numbers.

9. The method of claim 1, further comprising:

using data in the sequence of data traces to calculate one or more characteristics of the substrate.

10. The method of claim 9, further comprising:

modifying polishing parameters in the carrier head based on the calculated characteristics of the substrate.

11. The method of claim 9, further comprising:

detecting an endpoint of the polishing based on the calculated characteristics of the substrate.

12. The method of claim 9, wherein:

calculating one or more characteristics includes calculating characteristics of inhomogeneities in substantially evenly distributed radial directions across the substrate.

13. The method of claim 9, wherein:

calculating one or more characteristics includes calculating one or more characteristic thickness values for the substrate at one or more radial distances from a center of the substrate.

14. The method of claim 1, wherein:

acquiring a sequence of data traces using a sensor includes using the sensor to detect eddy currents in the substrate.

15. The method of claim 1, wherein:

acquiring a sequence of data traces using a sensor includes using the sensor to detect one or more optical properties in the substrate.

16. A system for monitoring polishing a substrate, the system comprising:

an in-situ monitor having a sensor mounted in a platen rotating at a first rotation rate, the in-situ monitor being configured to acquire a sequence of data traces, wherein each data trace results from a separate scan with the sensor along a path across the substrate carried by a carrier head rotating at a second rotation rate that is different from the first rotation rate;

and

a data processing apparatus configured to calculate one or more characteristics of the substrate from data traces resulting from a predetermined number of consecutive scans along a plurality of paths across the substrate, wherein the first and second rotation rates are such that the plurality of paths are substantially evenly radially distributed across the substrate.

17. The system of claim 16, wherein the predetermined number of consecutive scans is less than 10.

18. The system of claim 16, wherein a difference between the first and second rotation rates is between about four and about fifteen percent of the first rotation rate.

19. The system of claim 16, wherein:

the data processing apparatus is further configured to calculate modified polishing parameters for the carrier head based on the calculated characteristics of the substrate.

20. The system of claim 16, wherein:

the data processing apparatus is further configured to detect an endpoint of the polishing based on the calculated characteristics of the substrate.

21. The system of claim 16, wherein the calculated characteristics include one or more characteristics that characterize inhomogeneities in substantially evenly distributed radial directions across the substrate.

22. The system of claim 16, wherein the calculated characteristics include a characteristic thickness of the substrate for one or more radial distances from a center of the substrate.

23. The system of claim 16, wherein:

the in-situ monitor includes a sensor to detect eddy currents in the substrate.

24. The system of claim 16, wherein:

the in-situ monitor includes a sensor to detect eddy currents in the substrate.

25. A software product, tangibly embodied in a machine-readable medium, for monitoring polishing a substrate, the software product comprising instructions operable to

cause one or more data processing apparatus to perform operations comprising:

receiving a sequence of data traces acquired by an in-situ monitor having a sensor mounted in a platen rotating at a first rotation rate, each data trace resulting from a separate scan with the sensor along a path across the substrate carried by a carrier head rotating at a second rotation rate that is different from the first rotation rate; and

calculating one or more characteristics of the substrate from data traces resulting from a predetermined number of consecutive scans along a plurality of paths across the substrate, wherein the first and second rotation rates are such that the plurality of paths are substantially evenly radially distributed across the substrate.

26. The software product of claim 25, wherein the predetermined number of consecutive scans is less than 10.

27. The software product of claim 25, wherein a difference between the first and second rotation rates is between about four and about fifteen percent of the first rotation rate.

28. The software product of claim 25, wherein a difference between the first and second rotation rates is between about forty and about sixty percent of the first rotation rate divided by the predetermined number.

29. The software product of claim 25, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

calculating modified polishing parameters for the carrier head based on the calculated characteristics of the substrate.

30. The software product of claim 25, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

detecting an endpoint of the polishing based on the calculated characteristics of the substrate.

31. The software product of claim 25, wherein the calculated characteristics include one or more characteristics that characterize inhomogeneities in substantially evenly distributed radial directions across the substrate.